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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/978,308	10/17/2001	Mikihide Nakamaru	086531-0130	4330

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EXAMINER

PALABRICA, RICARDO J

ART UNIT	PAPER NUMBER
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3641

DATE MAILED: 01/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/978,308

Applicant(s)

NAKAMARU ET AL.

Examiner

Rick Palabrica

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 24 June 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) 3,7 and 11-13 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-6 and 8-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

1. Applicant's election without traverse of Group I (apparatus), species A and species F in Paper No. 11 is acknowledged.

2. Applicant also stated that claims 1-6 and 8-10 are readable on the elected species. The examiner disagrees because claim 3 pertains to thorium-containing fuel rods that are not present in the elected species (see page 23, 3<sup>rd</sup> full paragraph of the specification). Therefore, only claims 1, 2, 4-6, and 8-10 are examined in this Office Action.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1, 2, 4-6, and 8-10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 is vague and indefinite because it is unclear from the preamble what exactly is being claimed, i.e., is it the subcombination of a reactor core or a combination of a core and a pressure vessel. The same vagueness and indefiniteness problem

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pertains to the body of the claim that recites a core support plate mounted on an (sic) lower portion in said pressure vessel.

Terms such as "substantially", "effective", etc. are relative, they can be given no definite meaning and accordingly they render the claims vague and indefinite, and the metes and bounds thereof are undefined (e.g., see claims 4 and 10).

Claim 4 recites the limitations, "in which a burnable poison is added" and "concentration of said burnable poison is adjusted" that are vague and indefinite because it is unclear, e.g., when said poison is added or when the concentration is adjusted, i.e., before, during or after operation?

Claim 5 recites the limitation "c burnable poison" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim 5 recites the limitation "weight ratio of gadolinia particles or grains to fuel rods is 15 wt% or greater." This limitation is vague, indefinite and incomplete because the gadolinia particles or grains are being compared to a non-analogous item, i.e., "fuel rod."

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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4. Claims 1, 2, 4 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by any one of Gassmann (U.S. 5,677,938), or Specker et al. (U.S. 4,285,769), or Gyorey et al. (U.S. 3,385,758), or Fredin et al. (U.S. 3,929,565) or Crowther (U.S. 3,147,191). Any one of these references discloses a reactor core comprising a core support plate, upper grid, a plurality of fuel assemblies and a plurality of cross-sectional cruciform control rods each having four blades that are inserted into four adjacent spaces formed by four fuel assemblies facing each other.

Any one of these references also shows a reactor core wherein the B/S ratio is  $0.06 \text{ cm}^{-1}$  or greater. See Fig. 3 in Gassmann, or Fig. 2 in Specker et al., or Fig. 2 in Gyorey et al., or Fig. 8 in Fredin et al., or Fig. 2 in Crowther. Note that this B/S ratio is a relationship between blade width and pitch of the fuel assemblies. While patent drawings are not drawn to scale, relationships clearly shown in the drawings of a reference patent cannot be disregarded in determining the patentability of the claims.

See In re Mraz, 59 CCPA 866, 455 F.2d 1069, 173 USPQ 25 (1972).

The claims contain functional phrases or clauses such as "are inserted into four adjacent spaces", "in which a burnable poison is added", "concentration of said burnable poison is adjusted", "wherein said control rods are inserted from above in said pressure vessel", etc. that are essentially method limitations or statements of intended use or field of use. These clauses, as well as other statements of intended use do not serve to patently distinguish the claimed structure over that of the reference. See In re Pearson, 181 USPQ 641; In re Yanush, 177 USPQ 705; In re Finsterwalder, 168 USPQ 530; In re Casey, 152 USPQ 235; In re Otto, 136 USPQ 458; Ex parte Masham, 2 USPQ 2<sup>nd</sup> 1647.

See also MPEP 2114 that states:

A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647.

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531.

Apparatus claims cover what a device is, not what a device does." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 15 USPQ2d 1525, 1528.

As set forth in MPEP 2115, a recitation in a claim to the material or article worked upon does not serve to limit an apparatus claim.

In any case, any one of the devices cited in the above references is capable of being used in the same manner as the claimed invention.

As to claim 4, note that any one of these references discloses fuel assemblies with burnable poison. See column 7, lines 55+ in Gassmann, or column 11, lines 1+ in Specker et al., column 8, lines 16+ in Gyorey et al., or column 4, lines 40+ in Fredin et al., or claim 11 in Crowther. As to the claim limitation, note that fuel assemblies containing burnable poison in any one of the said references are capable of being left in the core until said poison is totally depleted (zero reactivity) when said fuel assemblies are discharged.

As to claim 9, note that any one of the cruciform control rods disclosed in said references are capable of being inserted from above the reactor pressure vessel.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over of any one of Gassmann, or Specker et al., or Crowther, as applied to claims 1, 2, 4 and 9, and further in view of the combination of Abate-Daga et al. (U.S. 3,917,768) and Alsop (U.S. 4,671,927). Any one of Gassmann or Specker et al. or Crowther disclose the applicant's claims except for the grain size and weight percentage of gadolinium oxide.

Abate-Daga et al. disclose a method of preparing a sintered nuclear fuel containing a consumable poison such as gadolinium oxide having 10 to 2000 microns diameter and uniformly distributed within the fuel (see column 1, lines 48+). They teach that uniform distribution can be achieved with gadolinium oxide having grain sizes in said range, and a uniform distribution allows the poison to be consumed at the same rate as the fuel (see column 1, lines 11+).

Alsop discloses a nuclear fuel rod containing pellets having 1 to 20 per by weight gadolinium oxide. Alsop teaches that incorporation of gadolinium oxide as a burnable absorber into a fissionable material, which is a well-known practice in the industry (see column 3, lines 65+). They also teach that gadolinium oxide provides for compensation

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for reduction in reactivity due to the consumption of fissionable material, and such compensation is achievable within said wt % range (see column 1, lines 35+ and column 2, lines 62+).

One having ordinary skill in the art would have recognized that the references cited above pertain to the same field of endeavor, and the teachings of Alsop and Abate-Daga et al. would apply to the primary references.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of any one of Gassmann, or Specker et al., or Crowther, by the teachings of the combination of Abate-Daga et al., and Alsop to have a gadolinium oxide uniformly dispersed as burnable poison in the nuclear fuel, said poison having a particle grain size between 50 microns and 200 microns and 15 wt % or greater, to gain the advantages thereof, because such modification is no more than the use of conventional designs/techniques within the nuclear art and well-known grain sizes, particle distribution mode and weight percentages in the nuclear pellet art.

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over any one of Gassmann, or Specker et al., or Crowther, as applied to claims 1, 2, 4 and 9 above, and further in view of Hida et al. (U.S. 5,524,033). Any one of Gassmann, or Specker et al., or Crowther disclose the applicant's claim except for the specific enrichment of the gadolinium isotopes with odd mass numbers in the burnable poison.

Hida et al. teach a nuclear fuel containing gadolinium as burnable poison (see Abstract and Fig. 1). Their nuclear fuel exhibits increased fuel burn up efficiency by



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increasing reactivity while minimizing any adverse effect on the shutdown and thermal margins (see column 1, lines 9+). They disclose embodiments as shown in Table 4 and Table 5 wherein the combined enrichment of gadolinium isotopes with odd mass numbers is greater than the corresponding combined enrichment in natural gadolinium. One having ordinary skill in the art would have recognized that these references pertain to the same field of endeavor, and the teaching of Hida et al. would apply to any one of the primary references.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus, as disclosed by any one of Gassmann, or Specker et al., or Crowther, by the teaching of Hida et al., to have a nuclear fuel with burnable gadolinium poison, wherein the combined enrichment of gadolinium isotopes with odd mass numbers is greater than the corresponding combined enrichment in natural gadolinium, to gain the advantages thereof (i.e., increased fuel burn up efficiency), because such modification is no more than the use of conventional designs/techniques within the nuclear art, and the use of well-known enrichment of such gadolinium isotopes.

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over any one of Gassmann, or Specker et al., or Gyorey et al., or Fredin et al. or Crowther, as applied to claims 1, 2, 4 and 9 above, and further in view of any one of Yamashita et al. (U.S. 4,483,818) or Ishii et al. (U.S. 5,145,635) or Johannesson (U.S. 5,359,634). Any one of Gassmann, or Specker et al., or Gyorey et al., or Fredin et al. or Crowther

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disclose the applicant's claim except for the difference in enrichment between the upper and lower portions of the fuel assemblies.

Yamashita et al. teach a fuel assembly wherein the enrichment of the upper part of the core is 5.0 wt% and that for the lower part is 5.6 wt%, in order to flatten the axial power distribution (see Abstract and column 4, lines 34+).

Ishii et al. teach a fuel assembly wherein the average enrichment throughout the upper half region of the core is 6.0% and throughout the lower half region is 7.0%, in order to reduce potentially dangerously high void coefficient in the core (see Abstract and column 4, lines 50+).

Johannesson teaches a reactor core that provides good shutdown margin, wherein the medium enrichment of the central rods and the edge rods in a horizontal section is 5-15% lower in the area of the upper part of the fuel rods than in the area of the lower part of the fuel rods (see column 2, lines 3+ and claim 4).

One having ordinary skill in the art would have recognized that the primary and secondary references pertain to the same field of endeavor, and the teaching of any one of the secondary references would apply to any one of the primary references.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus, as disclosed by any one of Gassmann, or Specker et al., or Gyorey et al., or Fredin et al. or Crowther, by the teachings of any one of Yamashita et al. or Ishii et al. or Johannesson, to have the fissionable material enrichment of the lower portions of the fuel assemblies higher than the upper portions by 0.3 wt % or greater, to gain the advantages thereof (e.g. flatter

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axial flux distribution), because such modification is no more than the use of conventional designs/techniques within the nuclear art.

8. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over either Crowther or Fredin et al., as applied to claims 1, 2, 4 and 9 above, and further in view of Ueda (U.S. 5,276,718). Crowther discloses the applicant's claim except for the thickness of the hafnium blade. Fredin et al. disclose the applicant's claim except for the hafnium blade of said thickness.

Crowther discloses the use of solid hafnium for the control blade (see column 25, lines 2+). Ueda discloses a control blade made of hafnium metal and having a thickness of about 8mm (see Abstract and column 12, lines 12+).

Fredin et al. disclose the use of boron carbide for the control blade material (see column 2, lines 55+). Ueda discloses a control blade made of either boron carbide hafnium metal (see column 6, lines 39+). Ueda discloses further a hafnium embodiment for the control blade having a thickness of about 8mm (see Abstract and column 12, lines 12+).

One having ordinary skill in the art would have recognized that these references pertain to the same field of endeavor, and the teaching of Ueda would apply to Crowther.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the hafnium control blade, as disclosed by either Crowther or Fredin et al., by the teaching of Ueda., to have a cruciform control rod made of hafnium to a thickness of 0.8 cm, because such modification is no more

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than the use of conventional designs/techniques within the nuclear art, and the use of a well-known control blade thickness and material.

### ***Specification***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

9. The disclosure is objected to because of the following informalities: On page 8, line 9, the  $0.5 \text{ cm}^{-1}$  is incorrect. On page 9, line 11, either "allows" or "promotes" should be deleted. On page 15, the 1<sup>st</sup> sentence of the 3<sup>rd</sup> paragraph should be improved. On page 15, 2<sup>nd</sup> to last line of 3<sup>rd</sup> paragraph, "driver" should be "dryer."

Appropriate correction is required.

### ***Conclusion***

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Reference M further illustrates prior art.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rick Palabrica whose telephone number is 703-306-5756. The examiner can normally be reached on 7:00-4:30, Mon-Fri; 1st Friday off.

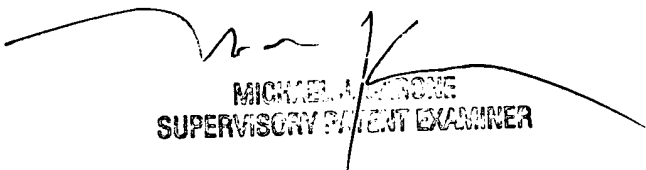
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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Carone can be reached on 703-306-4198. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-7687 for regular communications and 703-305-7687 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1113.

RJP

January 13, 2003.



MICHAEL A. CARONE  
SUPERVISORY PATENT EXAMINER